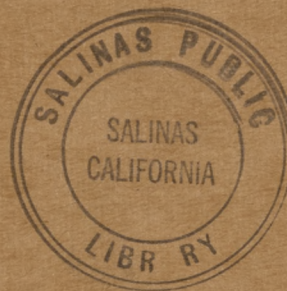


Spreckels

Bulletin

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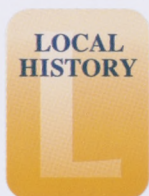
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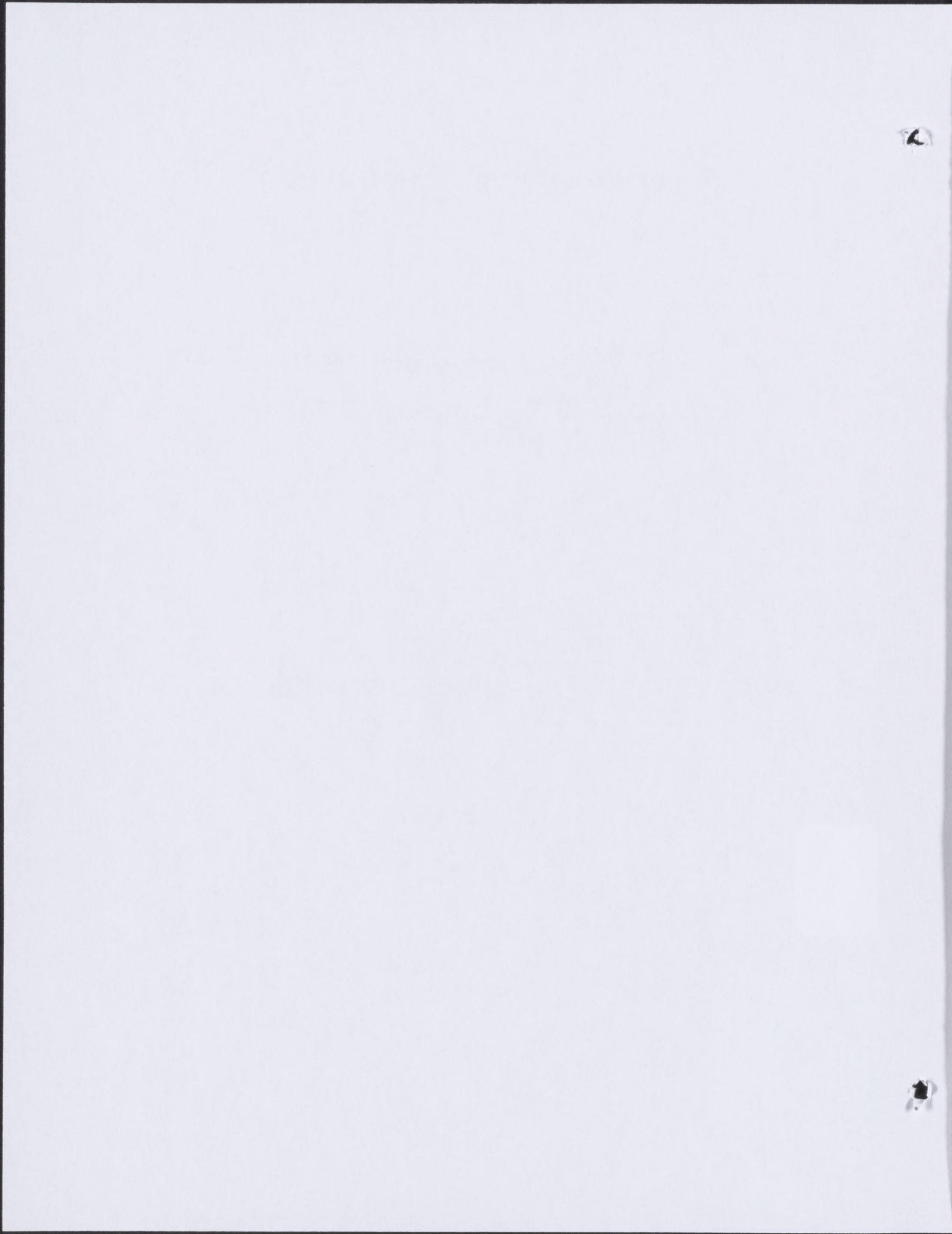
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SPRECKELS



BULLETIN

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Vol. VIX

MAY-JUNE 1945

No. 3

IMPROVED IRRIGATION PRACTICES
IN THE SACRAMENTO VALLEYBy AL KAAS, Agricultural Department
Spreckels Sugar Company

Sugar beets grown in the Sacramento Valley require irrigation to carry on growth during the summer months. The various practices used in irrigation of beets are similar, but there are a few methods used in some localities that may be of benefit to other localities.

The water used for irrigation comes from wells, ditch systems or drainage ditches and frequently is distributed in the field through head ditches. An early practice was to check the field by making levees every 24 or 36 rows and then cutting the ditch to allow the check to fill up with water. This flood irrigation (Figure 1) tended to drown out and scald many beets. Improvements in irrigation



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Fig. 1.—Flood irrigation of sugar beets is not conducive to good yields.



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Fig. 2.—Ridge planting gives better water control.

practices have helped increase yields of sugar beets in all parts of the Sacramento Valley during the past few years.

Planting sugar beets on beds or using the alternate wide and narrow row spacings in flat planting helps in getting a much deeper furrow in which to run the water (Figure 2). These deep ditches help to prevent flooding so that there is little baking and cracking of the soil around the plant.

(Continued on next page)

PUMP SELECTION AND MAINTENANCE

By T. W. SNELL, Division Manager
P. G. & E., Salinas, California

Modern electric pumps are most efficient when they are installed and used under operating conditions for which they are designed. Years of engineering research have gone into the development of irrigation pumps. All this research and work point out one thing above all others. Each pumping job is a separate problem and it is highly important that proper selection of pump and motor be made for each individual installation.

A pump's job is to move water; lift it out of the well, creek or river to an open discharge above ground level or push it through a pipeline to where it is to be used. The water so moved has weight, and to move weight takes power. The amount of power required depends on how much water is to be moved and where, and how good a job the pump is able to do. If it is not the right pump for the particular job, it will not do an efficient job. It will cost more to operate and this may amount to considerable, especially where the pump runs many hours during the year.

If a low efficiency pump is installed, the water delivered may cost twice what it should. It is like using a four-ton truck for a two-ton job. A good two-ton truck would cost less to operate and would do a better job.

It sometimes happens that a pump is moved from one location to another. Pumping conditions may not be the same. If they are not, performance of the pump will be affected in proportion to the difference in pumping conditions. It may be better, but it can also be much worse. In one case where a pump was moved, an increase of 4 per cent in the pumping lift doubled the cost of operation. A decrease in lift may also result in lowering the pump efficiency. A competent pump engineer should be consulted whenever a pump is to be moved from one location to another.

SELECT PROPER PUMP AND MAINTAIN AT HIGHEST EFFICIENCY

Second in importance to selecting the proper pump is maintaining the pumping plant at the highest efficiency possible. Pumps wear and have difficulties that are not easily seen, but which may affect their efficiency to a considerable degree. Runners may become clogged, vanes may corrode or break off, oil pipes may get plugged, the water table may change, or they may gradually lose efficiency over a period of years from ordinary wear and tear. In one specific case a 30-horsepower pump had been run-

(Continued on next page)

HONEY-DEW

IRRIGATION (Continued from page 17)

Small metal dams (Figure 3) have been developed to use in the furrows to hold back the flow of water in fields where the fall is too great to allow for proper penetration. Several of these dams can easily be carried along with the irrigator and placed in the furrow when necessary.

Syphons, lettuce boxes and pipes are being used instead



Fig. 3.—Metal dams used to pre-irrigate ridges eliminate flooding in uneven land.

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of cutting the ditch to distribute water to furrows. Syphons are the most satisfactory as the ditch is kept intact and there is less chance of ditch breakage. Relatively few syphons are needed as they can be moved from place to place, while pipes or lettuce boxes are placed in the ditch and cannot be moved without considerable work.

Another method of irrigating used in the Sacramento Valley is the use of the rain machine. The rain machine is used in fields which are too uneven for surface irrigation or where the water table is high. A small amount of water can be distributed evenly over the field with a rain machine, supplementing the sub-moisture in high water table fields.

The practices mentioned above are all related to the actual job of applying the water. The proper time to apply water is just as important. The use of a soil tube and the taking of soil samples to find the amount of moisture in the soil between irrigations is valuable in determining when the next irrigation should be applied.



Fig. 4.—Pipe used in place of head ditch with gate valves to control flow of water into furrows. Sacks over outlets prevent washing in furrows.

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PUMPS (Continued from page 17)

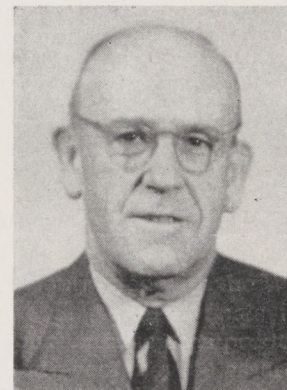
ning for a number of years until a test showed it to be operating at 34.7 per cent overall efficiency. The pump was reconditioned, after which another pump test was made. The retest showed the overall efficiency had been raised to 58.3 per cent. The water delivery was increased from 350 gallons per minute to 540 GPM and the yearly pumping cost was reduced \$117.00.

To help its farm customers maintain their pumping plants at high efficiency, the Pacific Gas and Electric Company maintains a free pump test service. This work is carried on by six crews of experienced test engineers who do the testing under actual field conditions. After each test a written report is furnished giving the overall efficiency, the gallons per minute pumped and other information helpful to the pump operator. From this report he can decide what action is necessary to maintain his equipment in top condition.

The P. G. & E. does not sell or repair pumping plants. Pump dealers and manufacturers have well equipped shops and personnel capable of handling these functions.

HENRY SEVIER BECOMES SPRECKELS GENERAL LABOR SUPERVISOR

Henry Sevier, for many years the superintendent of farm operations of the University of California at Davis, was employed by California Field Crops, Inc., in 1943 to assist its General Manager, J. E. Coke, in the handling of the Mexican National labor program. Starting in February, 1945, the various beet sugar processors comprising California Field Crops decided the program had developed to the stage where each of the companies could handle its own labor problems, and Mr. Sevier was then employed by the Spreckels Sugar Company and placed in charge of its agricultural labor program.



Henry Sevier

Mr. Sevier speaks Spanish fluently, not only as the result of studies in this country, but because of several trips to Mexico. His headquarters are in San Francisco and he is in charge of the Company's labor program in the Sacramento, Salinas, and Bakersfield areas.

Spreckels Sugar Company has contracted with the War Food Administration for 2,200 Mexican Nationals for 1945, who are being located throughout the area producing beets for it, in order that its growers may be assured of an ample supply of labor to carry on their sugar beet farming operations. In addition, the Spreckels Sugar Company has contracted with the Army for War Prisoners for use in the Salinas and Stockton areas and is making every effort possible to assure growers producing beets for the Company a supply of labor throughout the season.

THIS ISSUE:

The material for this issue of the Spreckels Sugar Beet Bulletin was assembled and edited by W. B. Marcum, Field Superintendent in the Spreckels District, with the help of R. S. Lambdin and A. H. Kaas.

PROPER IRRIGATION DEMANDS CAREFUL STUDY

By WARD C. WATERMAN, *Agricultural Superintendent
Spreckels Sugar Company*

If irrigation is the most important single factor of all the requisites to successful sugar beet culture in California, it is fortunate because its fundamentals can be measured, computed, and controlled much more readily than most of the other important factors, such as plant food, soil bacteria, or climatic conditions.

Only a portion of the total moisture in the soil at any given time is "available moisture" to the growing plant. The quantity of available moisture that a soil may provide depends upon its texture, which will vary from a low water-holding capacity in sand to a large capacity in clay.

The soil acts as a reservoir, holding water in its pore space between the soil particles. Since the capacity of this reservoir depends largely upon the texture of the soil, the following figures are listed to provide an idea of the approximate quantity retained by various textured soils:

ACRE INCHES OF WATER RETAINED PER ACRE FOOT OF DEPTH

Soil Texture	At Field Capacity	At Wilting Point	Available to Plants
Fine sand	1.1	.4	0.7
Loamy sand	1.5	.5	1.0
Sandy loam	1.9	.7	1.2
Fine sandy loam	2.2	.8	1.4
Loam	2.5	.9	1.6
Silty loam	2.8	1.10	1.7
Clay loam	3.1	1.30	1.8
Clay	4.0	2.00	2.0

Moisture in soils under field conditions is never entirely uniform or stable. Soil texture may vary somewhat and its water-holding capacity will vary accordingly. Upon completion of an irrigation, the soil is completely wet to the depth of water penetration. Water applied to the surface of the soil moves downward by gravity until a stage of moisture content, called "field capacity," is reached. The entire soil column through which the surface water pene-

trates is brought up to field capacity. Soil moisture is lost by evaporation only in the upper ten to sixteen inches of soil. Below this depth moisture is removed only by plant use down to the "wilting point." Investigations show that moisture is used by the plant to the full depth to which the roots have penetrated, but that a much larger proportion is used from the upper three or four feet than below that depth until the wilting point is almost reached.

Except for special conditions, a two or three-inch application of water is too light for good efficiency. Usually an application in excess of six inches is necessary to replenish used moisture, but the amount depends upon the depth of penetration desired, texture of the soil, and the amount of moisture in the soil before the water was applied.

The rate at which soils absorb moisture during irrigation varies widely and depends largely upon the texture and structure. The length of irrigation furrows has a prominent bearing on depth of application throughout the field. If a small stream of water is turned into a furrow so that it requires considerable time for the water to reach the end, the upper portion may receive too much water. Deep percolation causes loss of water if it goes below the root zone.

The frequency of irrigation will depend upon plant size, soil texture and depth, and climatic conditions. A heavy soil with a good water-holding capacity need not be irrigated as often as a sandy textured soil. The loams will also need less frequent irrigations than light soils, but the quantity applied per irrigation should be greater. Modifications are needed as different phases are met in soils. Plow sole and hard pan will retard downward movements of moisture, and in the case of hard pan downward percolation will be stopped completely and an area of soil containing free water may develop above the hard pan. Since most plant roots will not penetrate this area of free water, crop production may be decreased. To avoid this hazard, light, frequent applications would be the way to plan an irrigation schedule.

The well planned irrigation schedule must include primary consideration for the size of the irrigation stream in relation to the total area of the field and its peak load requirements for the entire growing season. The chart, figure 1, shows the mathematical relation between quantity of irrigation water applied to land and time required to cover an acre to various depths.

RELATION BETWEEN QUANTITY OF IRRIGATION WATER APPLIED TO LAND AND TIME REQUIRED TO COVER AN ACRE TO VARIOUS DEPTHS¹

Size of Stream		Ac.-Ins. Per Hour	2 Inches		3 Inches		4 Inches		5 Inches		6 Inches		7 Inches		8 Inches	
*G.P.M.	**C.F.S.		Hr.	Min.	Hr.	Min.	Hr.	Min.	Hr.	Min.	Hr.	Min.	Hr.	Min.	Hr.	Min.
100	0.22	1/4	9	03	13	35	18	06	22	38	27	09	31	41	36	12
150	.33	3/8	6	02	9	03	12	04	15	05	18	06	21	07	24	08
200	.45	1/2	4	32	6	47	9	03	11	19	13	35	15	50	18	06
250	.56	5/8	3	37	5	26	7	14	9	03	10	52	12	40	14	29
300	.67	3/4	3	01	4	32	6	02	7	33	9	03	10	34	12	04
350	.78	7/8	2	35	3	53	5	10	6	28	7	45	9	03	10	21
400	.89	1	2	16	3	24	4	32	5	39	6	47	7	55	9	03
450	1.00	1 1/8	2	01	3	01	4	01	5	02	6	02	7	02	8	03
500	1.11	1 1/4	1	49	2	43	3	37	4	32	5	26	6	20	7	14
600	1.34	1 3/8	1	31	2	16	3	01	3	46	4	32	5	17	6	02
700	1.56	1 1/2	1	18	1	56	2	35	3	14	3	53	4	32	5	10
800	1.78	1 3/4	1	08	1	42	2	16	2	50	3	24	3	58	4	32
900	2.01	2	1	00	1	31	2	01	2	31	3	01	3	31	4	01
1,000	2.23	2 1/8		54	1	21	1	49	2	16	2	43	3	10	3	37
1,100	2.45	2 1/4		49	1	14	1	39	2	03	2	28	2	53	3	17
1,200	2.67	2 3/8		45	1	08	1	31	1	53	2	16	2	38	3	01
1,300	2.90	2 1/2		42	1	03	1	24	1	44	2	05	2	26	2	47
1,400	3.12	2 5/8		39		58	1	18	1	37	1	56	2	16	2	35
1,500	3.34	3		36		54	1	12	1	31	1	49	2	07	2	25

¹After table by R. T. Burdick, in Colorado Farm Bulletin, Colorado State College, July-Sept. 1940.

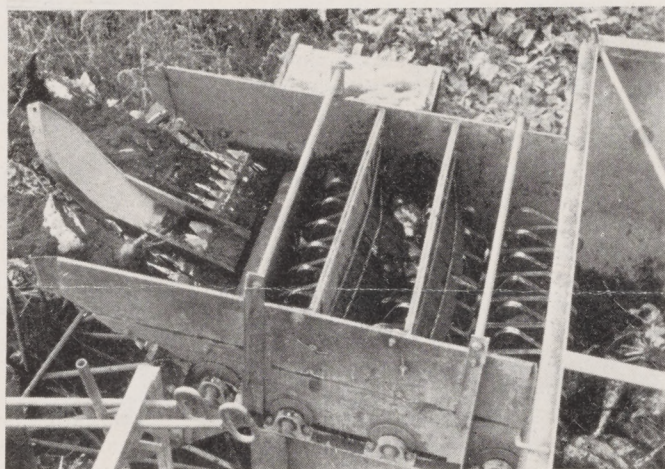
*G.P.M.—Gallons per minute.

**C.F.S.—Cubic feet per second.

THE FUTURE OF MECHANICAL HARVEST

By AUSTIN ARMER, *Agricultural Engineer*
Spreckels Sugar Company

Mechanical harvesting of sugar beets made remarkable strides in 1944. In California alone, an estimated 17 per cent of all beet acreage was dug, topped and loaded mechanically, the Marbeet harvester accounting for nearly all of this acreage.



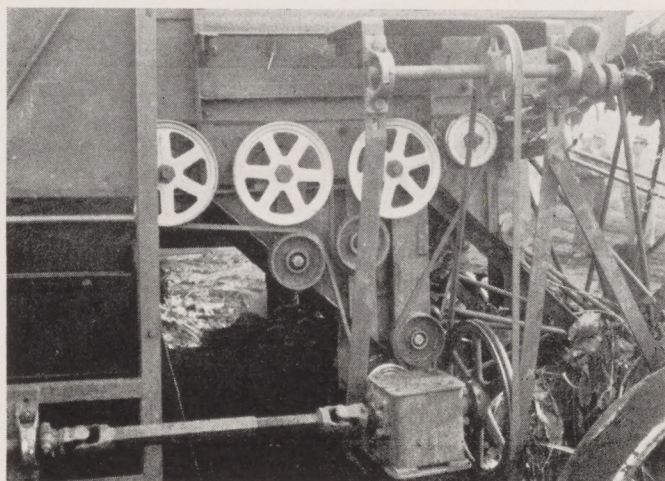
The topping and cleaning mechanism of the 1945 harvester is effective and minimizes plugging.

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In appraising the future of mechanical beet harvest, a review of accomplishments to date is of interest. Three commercial harvesters have emerged from the experimental stage, and did creditable work in certain sections of the Middle West and Intermountain states in 1944. These are the John Deere, International, and Scott Viner machines. They are relatively light, inexpensive, and have been designed to meet the conditions of soil, top growth and short harvest season prevalent in beet-growing districts other than California. The University of California Experiment Station at Davis is developing a precision type harvester which shows promise, but its availability through commercial channels remains for the somewhat distant future.

It is evident, therefore, that for at least several years the Marbeet harvester will retain its leadership in meeting California conditions of large fields, long harvest season, cloddy soil condition, and heavy tractor equipment.

The 1944 harvest season must be viewed as a large



Important changes in the 1945 harvester include self-aligning ball bearings throughout, "V" belt drives and a ball bearing Pitman drive for the sickle.

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scale experimental program for Marbeet harvesters. Only by the widespread use of these machines was it possible to reveal all of the weaknesses latent in the 1944 models. Most of these machines stood up mechanically for the first 50 or 60 acres, a season's work in the Eastern beet areas, but only a fraction of the service which must be expected of a California machine.

Growers displayed remarkable patience and cooperation, offering many valuable suggestions for reducing mechanical breakdowns and keeping the machines at work. By the time the harvest season was approaching a close, the machines had pretty thoroughly revealed their weak points. These were carefully analyzed by engineers of the Blackwelder Manufacturing Company and the Spreckels Sugar Company, who cooperated in mechanical redesign. The improvements were incorporated in two harvesters during the latter part of the 1944 harvest. Spreckels Sugar Company rebuilt one machine and the Blackwelder Co. another. Trials of these rebuilt machines in the two principal beet-growing districts covered well over 60 acres and gave a good indication that the troubles were eliminated.

Briefly outlined, the improved features include:

1. Grease-sealed ball bearings throughout.
2. Replacement of chains and sprockets by enclosed multiple "V" belt drives.
3. Rubber conveyor belts for beets and tops.
4. Ball bearing Pitman drive for the sickle bar.
5. A radically improved topping system to eliminate plugging by trash.
6. A more efficient shaker screen to eliminate dirt.
7. An improved plow system to facilitate adjustment and reduce draft.
8. Operator's platform on left side of machine so that operator can face his work and stand in a less dusty location.
9. Safety features to reduce accident hazards.

While each 1945 machine is confidently expected to harvest twice the acreage of the 1944 model, this improvement will be realized only if the machines are in the hands of competent operators. Actual cost analysis has proved that harvester operation costs less per acre with a well paid operator (skilled in grain combine operation) than with a lower paid handyman. Growers should realize that each harvester has a daily output equivalent to about \$200.00 worth of hand labor. Thus the premium paid for a skilled operator represents a small percentage of the machine's worth, yet skilled operators can increase output as much as 25 per cent.

RATION-EXEMPT SUGAR FOR GROWERS

The privilege of receiving ration-exempt sugar for family and employee use, granted last year to growers of sugar beets by the Office of Price Administration, has been extended another year by that office, as announced on March 26.

Amounts are limited to 25 pounds for each member of the grower's family and to the employees for whom he regularly provides meals and who work more than six months a year on the farm where the beets are grown. In no case, however, may the total exceed 25 pounds for each acre harvested for sale from the 1945 crop.

The ration-exempt 1945 crop sugar will be distributed by the Spreckels Sugar Company to eligible growers in the same manner as 1944 sugar. However, since the 1945 sugar must be from 1945 production, it will not be available until later in the year. The places where the sugar may be obtained will be announced in a subsequent issue of the Bulletin.

GATE CONTROL ON SYPHONS GIVES BETTER WATER CONTROL

By BEN MARCUM, Agricultural Department
Spreckels Sugar Company

Many sugar beet growers use syphon tubes to obtain better distribution of their irrigation water from head ditches to furrows. Even better distribution may be obtained by the use of gate controls.

Advantages of syphons over other methods of distribution are as follows:

1. A definite saving of labor due to ease of operation.
2. Saves cost because of lasting quality.
3. Saves power since little water is wasted.
4. Increases production because of uniform distribution and more adequate penetration.



Fig. 1.—Gate slides over rolled end of tube and can be adjusted to regulate flow of water.

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Fig. 2.—Flow of water is regulated so that each furrow receives the same amount.

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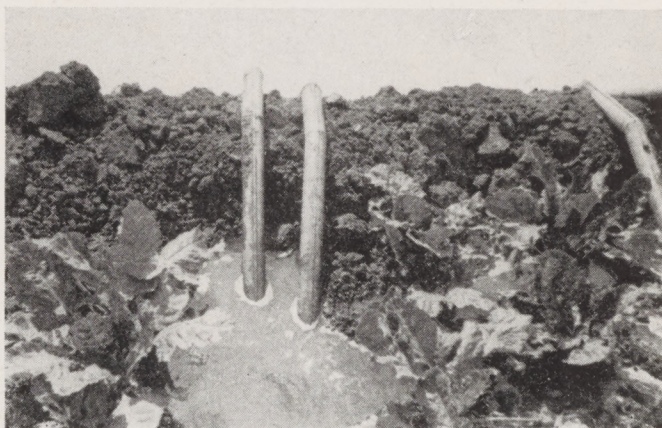


Fig. 3.—One or more syphons can be placed in a furrow, depending upon the quantity of water desired.

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FIELD NOTES . . .

EARLY THINNING OF BEETS ELIMINATES SEEDLING AND WEED COMPETITION AND PROMOTES EARLY GROWTH.

CLOSE CULTIVATION SAVES THINNING AND HOEING LABOR.

EARLY HOEING INSURES CLEANED FIELDS, THEREFORE DECREASES HARVEST PROBLEMS.

THIS IS THE TIME FOR SUPPLEMENTAL FERTILIZER. NH₃ APPLIED IN IRRIGATION WATER WILL NEED AN ADDITIONAL IRRIGATION PRIOR TO HARVEST TO OBTAIN FULL NUTRITIVE VALUE.

PLAN YOUR HARVEST PROGRAM EARLY. ASK YOUR FIELDMAN FOR INFORMATION ON NEW BEET-HARVESTER DEVELOPMENTS.



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Interest in mechanical beet harvesting in California as far back as twenty-five years ago is evidenced by the above photograph of a beet harvester developed about 1920. This photograph recently came to light from a file of old photographs in the Spreckels Office of the Company.

ERADICATION OF ANNUAL WEEDS

By T. W. THWAITES, Assistant County Agent
Monterey, California

THE PROBLEM

Weeds along ditches, fence lines, roadways, windbreaks and around buildings are a problem to eradicate. They are important because:

1. The seed produced by them infests surrounding farm lands.
2. They clog drain and irrigation ditches, making it necessary to clean them out by shovel, hoe or drag line.
3. They are a fire hazard around buildings.
4. Insects live or hibernate in weed patches, some being aphids, thrips, leafhoppers, vegetable weevil and Diabrotica.
5. Many plant diseases infest weeds and spread to crops. Examples are spotted wilt, Asters yellows, pea mosaic, Western blight and Western yellows of tomatoes.



Weed control on drainage canal. Spray control of Dow contact herbicide on left, diesel fuel in center and unsprayed on right.

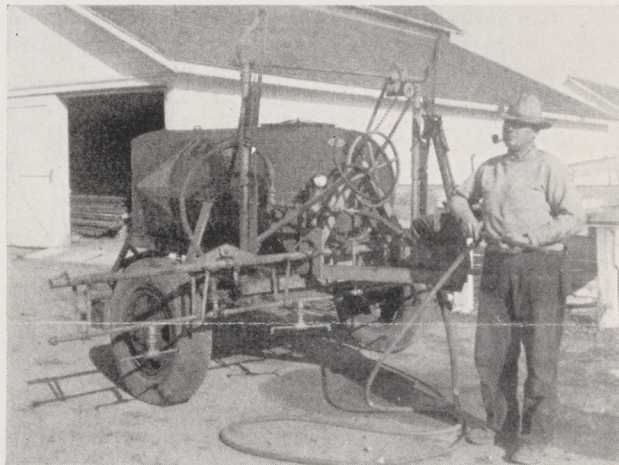
METHODS OF ERADICATION

Weeds are eradicated most easily when they are small. Early eradication also prevents seeding. When weed spray is used, small weeds require less spray material, the spray material contacts the weeds easier and the work can be done more rapidly.

1. **Mechanical cultivation** of those areas accessible is the easiest and usually the most economical.
2. **Burning** by the use of flame throwers developed for the purpose is slow but satisfactory, again providing the weeds are small when the work is done. The larger the weeds, the longer the flame must be applied in order to kill them.
3. **Chemical control** by the use of any of the following is effective on annuals. Perennial weeds such as morning glory, Johnson grass, hoary cress, knapweed, and so forth, require special treatment.
 - a. **Diesel oil or stove oil**—Of the two, Diesel oil is the most effective and the cheaper. The quantity needed depends on the size of the weeds. Weeds must be thoroughly wetted to kill them. This holds true for all weed sprays. Oils are critical materials and their use on weeds at present is restricted to agricultural lands by the War Production Board. Oils are not very effective in eradicating patches of hemlock, wild carrot and wild parsley.
 - b. **Dinitros**—DOW CONTACT HERBICIDE is a dinitro. It is effective on most annuals. Three gallons per

100 gallons of water is the mixture recommended. This is readily emulsified.

SINOX POWDER, at the rate of 2 to 4 pounds to 25 gallons of Diesel or stove oil plus an emulsifying agent added to 75 gallons of water, is effective. A spray outfit with a large agitator is needed to emulsify this material.



Walter Schween, Jr., Blanco farmer, demonstrates power spray rig for weed control. Nozzles on boom are used to spray weeds in various field crops. Hand gun, used in orchard spraying, can also be used for weeds along ditch banks, etc.

- c. **Arsenicals**—These materials are very poisonous to both man and livestock. They should be used cautiously and only in areas where livestock are not present. The smoke from burning weeds sprayed with arsenicals may cause irritation of the skin. The application of these materials may sterilize the soil up to five years.

Dry white arsenic (arsenic trioxide), at the rate of 4 pounds per square rod, is used as a dry powder and is dusted on bare soil to sterilize it.

Sodium arsenite is a solution that is sprayed on weeds. The stock solution is purchased and diluted with water as specified on the container.

- d. **Chlorate**—Sodium chlorate and calcium chlorate are materials which may be applied as dusts or in solution. They will sterilize the soil for a period of time. Sodium chlorate is inflammable.
- e. **Ammonium sulfamate**—Sold as AMMATE, it is recommended particularly for poison oak and can also be used on weeds as a spray.



Display of hand equipment used for weed control. From left to right: Hand pump on carriage, knapsack sprayer, weed burner. Foreground, weed spray gun, broom type. Background shows old style hoe.

(Continued on next page)

To be effective, spray materials must contact the weeds. Frequently in weed patches that are thick and have grown tall it is difficult to wet the weeds entirely. This may necessitate making a second application about two weeks after the first. Burning the weeds after the first application of spray also helps expose the portions of the plants that have not been previously contacted by the spray material.

EQUIPMENT

This can consist of the simplest type, such as a sprinkling can, or the more improved and effective method of using a power spray rig. If the farmer has a considerable area to clean up he may be justified to invest money in a power sprayer. In using the power sprayer, a pressure can be developed that will put out a large volume of spray and at the same time the liquid is broken down into a fine mist. This allows for better wetting and coverage and doing the job much faster.

It is frequently practical to construct a boom with a number of nozzles on it which will extend over the area to be sprayed. This is attached to the side of the spray outfit. In areas that cannot be reached in such a manner, it will be necessary to use a hand spray gun. These can either be purchased or constructed by the farmer.

FURTHER INFORMATION

There are a number of University of California bulletins and circulars that are available at either the College of Agriculture in Berkeley or Davis, or the local Agricultural Extension Service Office. Circular 97—WEED CONTROL—is a bulletin that covers the entire weed problem. Bulletin 666—SPRAYING EQUIPMENT FOR PEST CONTROL—and a Division of Botany circular—EQUIPMENT FOR SPRAYING WEEDS IN VEGETABLE CROPS—contain information in regard to equipment.

RECENT DEVELOPMENTS IN INSECT CONTROL

By DR. HARRY LANGE, JR., *Entomologist, University of California Agricultural Experiment Station, Salinas*

The sugar beet grower, as well as the grower of other field and vegetable crops, has felt the impact of the war in relation to his insect and nematode control program. He is confronted with a host of new chemicals, most of which are unobtainable under war conditions, often referred to in periodical, popular magazines, and which may or may not divulge the entire picture of their efficacy. This article is prepared in order to clarify the insect control program under war conditions and to present new developments particularly of interest to the sugar beet grower.

Since 1942 the Division of Entomology and Parasitology of the University of California has undertaken research work in the Salinas Valley on insect problems of an immediate nature confronting growers of field and vegetable crops. The methods of control outlined here refer to the work done in this area and in all cases may not be applicable to other California localities.

RECENT INSECTICIDES

Two new chemicals have recently received a good deal of publicity in popular and scientific journals. These materials are not available at present to the sugar beet grower, nor have their insecticide or nematocide potentialities been thoroughly explored. They are, however, often confused with one another, and the grower should be familiar with these distinctions.

"DDT," Gesarol, GNB-A, or Neocide.—This material is known technically as 1, 1-bis (4-chlorophenyl)-2, 2, 2-trichloroethane, conveniently called DDT from the generic name "dichloro-diphenyl-trichloroethane." Preliminary tests by the U. S. Bureau of Entomology experiment station workers, and others, have indicated that it is one of

the more promising synthetic organics. It has shown promise for the control of many insects including lice, bed bugs, houseflies, fleas, many lepidopterous larvae, certain leafhoppers, certain scales, and others. Its possible use for the control of sugar beet insects has not been explored. In laboratory work at Salinas 1 and 3 per cent dusts and sprays containing from 0.3 to 3 per cent DDT gave excellent kills on lygus bugs, diabrotica beetles, vegetable weevil larvae, and potato tuber moth larvae and adults. This material is under allocation by the War Production Board and at present is not available for civilian or agricultural uses except in limited quantities for experimental purposes.

DD or Dichloropropane and Dichloropropylene Mixture.—This material is a dark-colored liquid used as a soil fumigant for the control of nematodes and certain soil dwelling insects. It should not be confused with DDT. Carter (1943) first reported on DD for root knot nematode control in Hawaiian pineapple fields and again by Carter (1944) for certain ground beetle larvae in the soil around the roots of nursery stock. Stone (1944) found the material to be toxic to larvae of the sugar-beet wireworm in southern California. In the Salinas Valley experiments are in progress testing this chemical on the root knot nematode, sugar beet nematode, wireworms and garden centipedes. The results of preliminary work on the wireworm indicated that a pre-planting treatment of infested soil during November of 1943 showed a three-fold increase in lettuce production during May, 1944, using 400 pounds of DD and 35 pounds of ammonia to the acre. Plots in which 200 and 600 pounds of DD were used without ammonia also showed significant increases in yields over the untreated check areas and in addition the lettuce matured 10 days in advance of the untreated areas. In the tests to date the material has been drilled into the ground by the continuous flow method at a 6 to 8 inch level with 18-inch spacing. This material is distributed by the Shell Chemical Company, but is limited in quantity and up to the present time is not available in sufficient quantities necessary to permit commercial application of any substantial acreage of infested land.

The non-availability of these materials makes it necessary for the grower to use other materials which are available and have been under experimentation in the Salinas Valley during the past two years. These will be mentioned below.

WIREWORMS

Wireworms of the genus *Limoni* (*L. canus*, *L. californicus*, and *L. infuscatus* are the common species in most of California) are one of our more destructive pests in certain irrigated truck-crop land in California. They are the larvae or immature forms of click beetles, are yellowish-brown, segmented, and attain a length of from 1/2 to 2 inches.

The adult beetles spread the infestations in the spring and fall when they emerge from the ground. The eggs are white, and are laid singly in the soil. In about a month the eggs hatch into small wireworms and start a cycle which may last from one to several years.

Control of wireworms involves either the use of cultural practices which are unfavorable to wireworm development, or the use of chemical treatments, or a combination of both. Rotation plots in the Salinas Valley indicate that the continuous growing of truck crops tends to increase numbers of wireworms. Alfalfa in certain instances where it is irrigated continually, especially in the spring, seems to increase wireworms in the Salinas Valley, but in the rotation plots where irrigation was restricted the growing of

(Continued on next page)

INSECT CONTROL (Continued from page 23)

alfalfa was not favorable to wireworm development. A vetch cover crop allowed to carry over through the spring also tended to dry out the soil and make conditions unfavorable for wireworm increase. Lane (1941) in the Pacific North-west also found that alfalfa was not favorable to wireworm development provided that it was kept on the dry side, especially if no irrigation was used in the spring prior to the first cutting.

Time of planting is important.—The sugar-beet grower can often avoid severe injury in infested fields by planting early so that the plants are a good size in late April and May when the wireworms are active at the surface.



Use of granular calcium cyanide on the F. Minhoto ranch, San Juan Bautista, for the control of wireworms; above, drilling the cyanide into the sugar beet seedlings; below, rolling the surface after treatment.

Granular calcium cyanide.—This method has been found fairly successful in California, although in heavily infested fields the population cannot in all instances be reduced sufficiently to escape subsequent damage by using a single treatment. A bait crop should be planted in the spring when the wireworms are active at the surface. Usually cull beans (preferably small whites, limas or other white beans are preferable to dark-skinned varieties) are drilled into the ground just like a regular crop and the ground must be in good condition and with enough moisture present to germinate the seed. The cyanide is drilled into the exact rows where the beans were planted, preferably about 1/2 inch below the beans with the same planter used in planting the beans, using 100 to 110 pounds of cyanide to the acre. The cyanide usually is drilled into the beans in from 3 to 8 days when the wireworms start feeding on the seed and are present in suffi-

cient numbers to warrant treatment. In the Salinas Valley a roller is often used to help seal the surface of the ground, especially in lighter soils. The use of cyanide on a crop already damaged, without planting a bait crop, is usually not satisfactory, but in two instances in the Salinas Valley during 1944 fairly good kills were obtained by drilling the cyanide into small seedling beets. The results are indicated in the tabulation below:

RESULTS OBTAINED IN DRILLING GRANULAR CALCIUM CYANIDE INTO SUGAR BEET SEEDLINGS DURING 1944

Field	Date Applied	Amount Applied	% Reduction in Number of Wireworms
F. Minhoto San Juan	March 15, 16	110 pounds	79
N. Forden King City	April 13	100 pounds	86

Using Planet Jr. hoppers and plates the size of the opening needed to put out 100 pounds of granular calcium cyanide to the acre will vary from number 22 to 27 depending upon the speed of the tractor. The treatment of the F. Minhoto field in San Juan is shown in the photograph.

Dichlorethyl ether.—This material has been used as a repellent and toxicant in the Salinas Valley chiefly on seedling plants, particularly lettuce, just prior to thinning for the control of wireworms, maggots and garden centipedes. Its application to sugar beets has not been thoroughly tested. The ether is used at the rate of 600 gallons to the acre of a 0.5 per cent strength (0.5 gallon to 100 gallons of water) applied through regular sprayers which have the nozzles removed. At this dosage it is chiefly a repellent and usually enables the plants to get established before the centipedes or other insects come to the surface. It also kills on contact. The material is available on the market with emulsifier added so that it can be mixed instantaneously with water. If no emulsifier is present the addition of 1 1/2 ounces of *Aerosol OT* to each gallon of ether will serve as an emulsifying agent.

Other Chemicals.—Carbon bisulphide is used at the rate of one fluid ounce every 24 inches at a 2-inch depth. It is best to treat in the fall when the soil is in good condition for adequate diffusion of the gas and the temperature is above 60° F. Its expense is usually prohibitive in large-scale control operations. Crude naphthalene is used at the rate of 500 pounds to the acre and mixed thoroughly with the soil. It is difficult to obtain the crude form at the present time and the refined material may be too expensive for field application on an economical basis.



Method of applying dichlorethyl ether to lettuce seedlings; Pedroni Ranch, Salinas.

SPRECKELS



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REVIEW OF BEET CULTURAL PRACTICES IN SALINAS DISTRICT

THE SALINAS DISTRICT, WHICH INCLUDES MONTEREY, SAN BENITO, SANTA CRUZ, AND SOUTHERN SANTA CLARA COUNTIES, IS ONE OF THE OLDEST BEET PRODUCING AREAS IN THE UNITED STATES AND HAS A CONTINUOUS RECORD OF HIGH YIELDS. A PICTORIAL REVIEW OF SOME OF THE CULTURAL PRACTICES USED IN THIS DISTRICT IS PRESENTED IN THIS ISSUE.

This issue of the Spreckels Sugar Beet Bulletin is devoted to a review of some of the cultural practices used in the district adjacent to the Spreckels Sugar Company's factory at Spreckels, California, which includes Monterey, San Benito, Santa Cruz, and southern Santa Clara Coun-



Fig. 1. Most of the land on which sugar beets are grown in the Spreckels Factory District has been properly graded, permitting even distribution of irrigation water without flooding. Irrigation costs and volume of water used are thereby reduced.

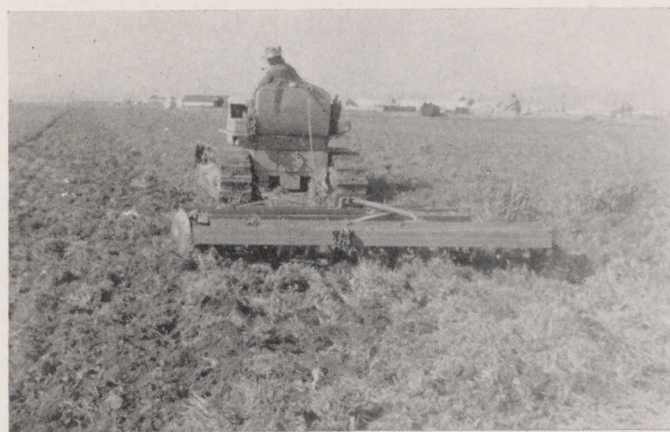


Fig. 2. Cover crops are used generally in this area. The organic matter added maintains the soil in good physical condition and increases the benefits from commercial fertilizer applied.

ties. The district includes the Salinas Valley of Monterey County, the Pajaro Valley of Santa Cruz County, the San Juan and Hollister areas of San Benito County, and the Gilroy area of Santa Clara County.

This district is outstanding in production of beet sugar per acre and it is hoped that growers may find it of interest and value to know of some of the cultural practices used in this area.

No attempt has been made to include all the cultural operations used in this district or to indicate the exact sequence of these various operations. In general, however, the following practices do illustrate the principal operations as carried on in this area.

It is planned in a future issue of the Bulletin to review in a similar manner the cultural practices used in other areas producing beets for the Company.

The material for this issue of the Bulletin was prepared principally by Mr. William Redding, Assistant Agricultural Engineer, and Mr. W. B. Marcum, Field Superintendent, in the Spreckels Factory District.

YIELD OF SUGAR BEETS PER ACRE IN SALINAS DISTRICT
COMPARED WITH THE AVERAGE IN THE REMAINDER
OF CALIFORNIA (TONS)

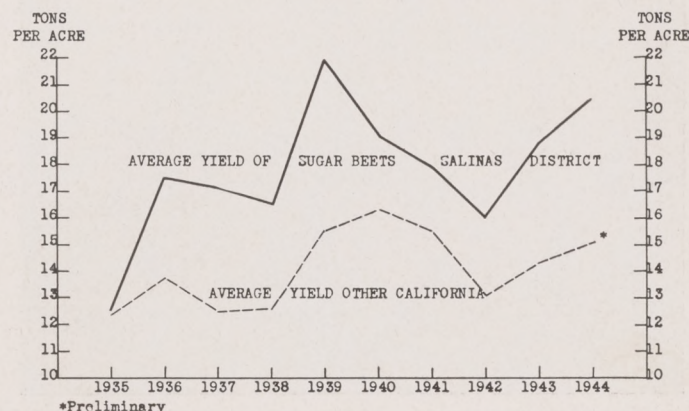


Fig. 3.

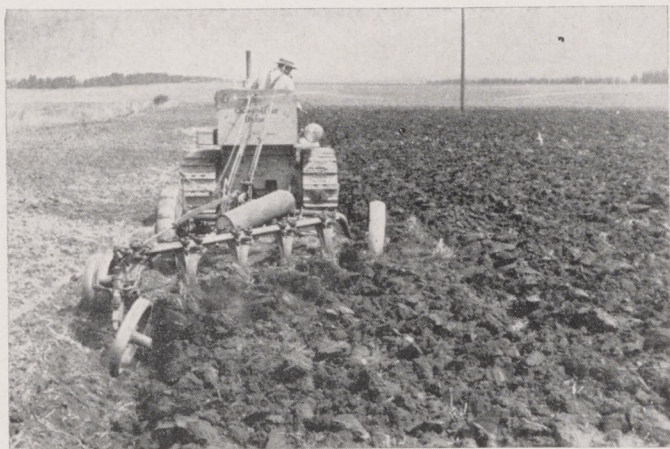


Fig. 4. The land is usually prepared for sugar beets by plowing in the fall, or when the soil is dry, in order to condition the soil for subsequent operations and to permit thorough aeration.



Courtesy Caterpillar Tractor Co.

Fig. 5. Subsoiling is frequently used after plowing to shatter plow pan and fracture hard subsoils.

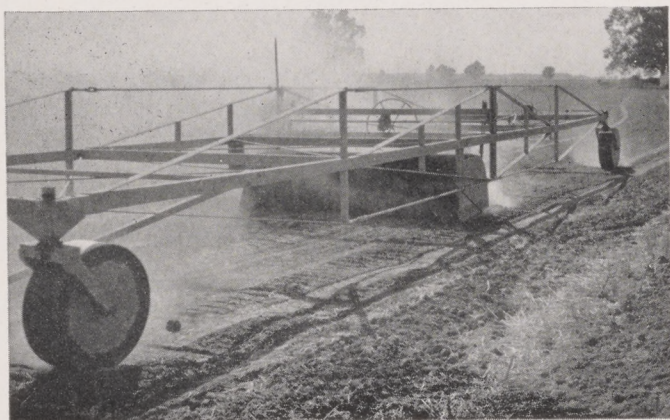
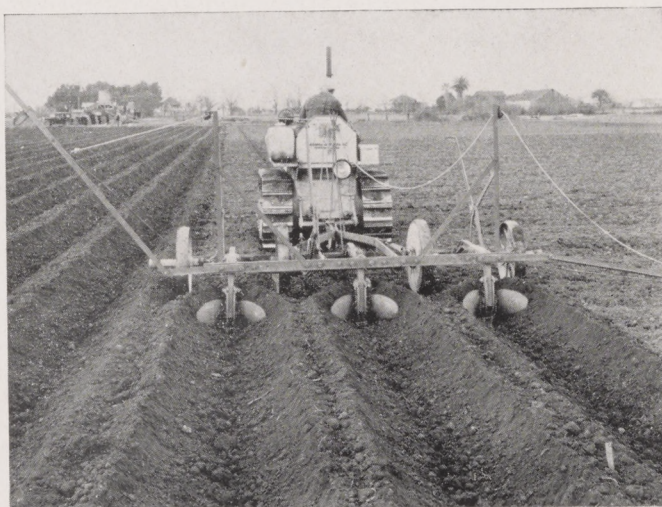


Fig. 6. Irregularities of land surface are removed each year in most of the area by the use of land planes.



Fig. 7. Deep chiselling in two directions, with the second chiselling always at right angles to the first, further conditions the soil for listing. Harrows or ring rollers are generally pulled behind the chisels to break clods and to compact the surface soil in order to reduce the loss of moisture.



Courtesy Caterpillar Tractor Co.

Fig. 8. All sugar beets produced in this factory district are grown on beds. The first step in bed formation is the construction of ridges by the use of lister shovels. Successful listing requires straight, uniformly spaced rows. (See March-April 1945 Spreckels Bulletin.)



Fig. 9. Ridges may be conditioned for planting by the use of a cultivator tractor equipped with knives to remove weeds and to break soil crusts on the top and sides of ridges.

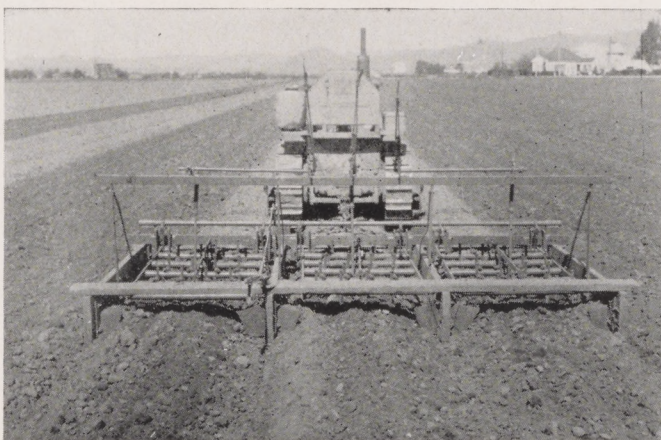


Fig. 10. Bed shapers are also used to form the beds, by levelling the top of the ridge, and to reshape the furrows. Sometimes they are equipped to remove weeds.



Courtesy John Deere Plow Co.

Fig. 11. Commercial fertilizer is applied on much of the acreage in this district prior to planting sugar beets. The fertilizer drill places the material so that it will be from 2 to 4 inches below the seed when planted. Amounts up to approximately 85 pounds of nitrogen per acre are used at the time of this operation.

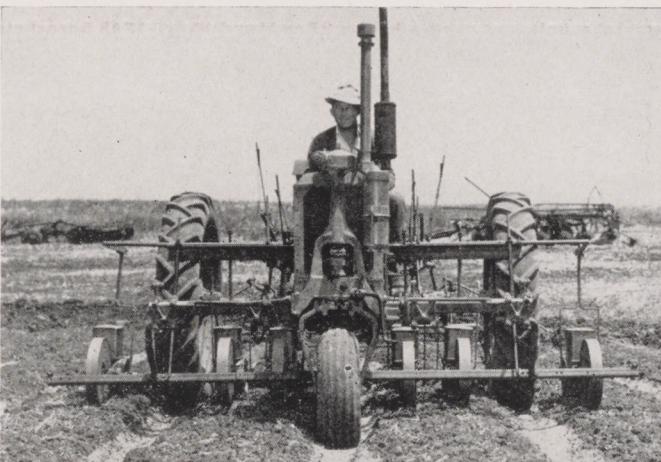


Fig. 12. Usually 4 single row planter units are rigidly mounted on a tractor cultivator bar or on a sled, each unit spaced to plant rows 12 to 14 inches apart on top of the beds and 26 to 28 inches between beds. The rigid mounting permits accurate spacing of rows. Planter units not in excess of 4 rows are used to reduce the space required for turning at the end of rows and to eliminate the necessity of planting headlands.



Fig. 13. Occasionally gypsum is applied after planting on top of beds to eliminate the formation of crusts which may occur following rains. Gypsum is also applied in the fall on a large acreage each year to improve the physical condition of the soil.



Fig. 14. A metal dam with adjustable gate permits maintaining a uniform head of water in the ditch so that the flow of water to the furrows can be accurately gauged.

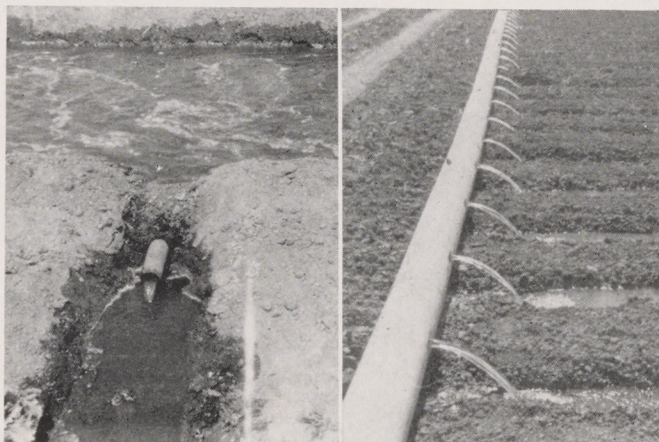


Fig. 15. With early season irrigation some method of distributing the water to the furrows is nearly always used, such as: tubes, pipes, and flues through the ditch, syphons over the ditch, or surface pipe with adjustable gates.

EXTRA SUGAR FOR GROWERS

As announced in the May-June issue of the Bulletin, growers producing sugar beets this year will again be able to obtain ration-exempt sugar. In addition to being ration-exempt, this extra sugar is also tax-exempt.

Amounts are limited to 25 pounds for each member of the grower's family and to the employees for whom he regularly provides meals and who work more than six months a year on the farm where the beets are grown. In no case, however, may the total exceed 25 pounds for each acre harvested for sale from the 1945 crop.

Growers producing beets for the Spreckels Sugar Company may obtain their sugar at any of the Company's factories at Spreckels, Woodland, or Manteca. Growers in the South San Joaquin area should call at the Company's office, 462 Haberfelde Building, Bakersfield, to make arrangements for securing their sugar.

The price of the ration-exempt sugar, unless modified by changes in Government price ceilings, will be as follows:

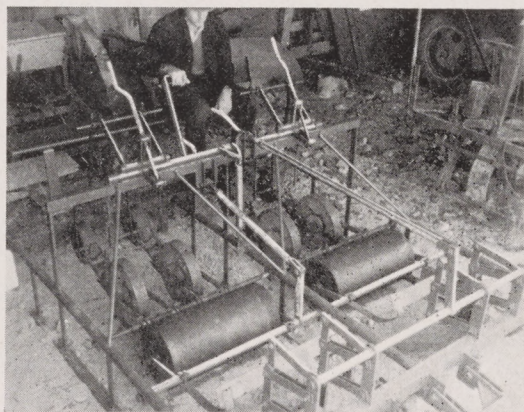
Sugar Secured at:	100# Paper	Containers		
		100# Towel	Bales 4/25# Towel	Single 25# Pockets
Spreckels	\$4.83	\$4.89	\$4.98	\$1.25
Manteca	4.81	4.87	4.96	1.24
Sugarfield	4.86	4.92	5.00	1.25
Bakersfield	4.88	4.94	5.03	1.26

As the Government regulation provides that the 1945 ration-exempt sugar must be from 1945 production, growers should not attempt to secure their sugar until after completing their harvest.

IMPROVED ADJUSTMENTS ON BED PLANTER SAVES MAN HOURS

By RALPH LAMBDIN, Assistant Agricultural Superintendent
Spreckels Sugar Company

Mr. James Ransdell, a grower of sugar beets in the Salinas area, has recently had a new two-bed sled-type planter built. This planter is equipped with crank screw adjustments on the front baffles, the rollers and the planter units. This equipment permits adjustments to be made quickly on the planter by merely turning a crank and the adjustments can be made while the planter is in operation. Considerable time is saved in meeting varied planting conditions with this type of planter.



Operator has hand on control, which raises planting units at end of row. Crank screw in front of operator controls baffles which shape the beds.



Fig. 16. Sometimes beet seed is planted in dry soil, after which the field is immediately irrigated to supply the moisture for germination. Distribution of water in the furrows must be accurately controlled when a crop of beets is "irrigated up."



Fig. 17. Discs, mounted on the cultivating bar of a tractor, are generally used for early season cultivation when the ground may be wet and the beets are small.



Courtesy John Deere Plow Co.

Fig. 18. Beets are cultivated immediately ahead of thinning by the use of flat knives on top of the bed and curved knives on the sides.



Fig. 19. Following thinning and hoeing, the sides of the bed are reshaped. Irrigation furrows are reformed by attaching small shovels to the cultivator. After the first irrigation large furrowing shovels are used to form adequate furrows for subsequent irrigation. During this operation flat sweeps or flat duck feet may be attached to the cultivator to cultivate the top of the bed.

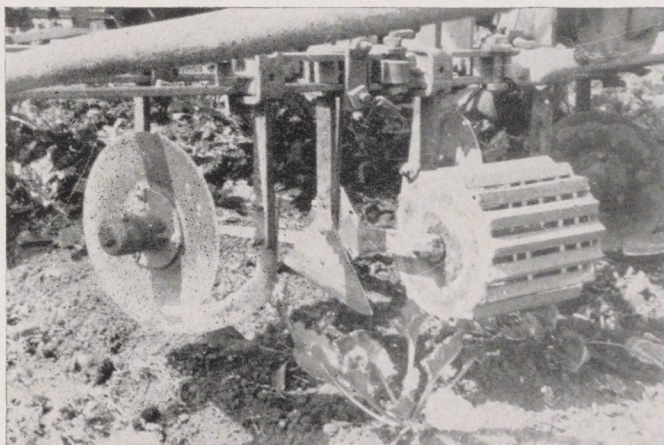


Fig. 20. A combination of cultivator tools is sometimes used in the area—consisting of roller, disks, curved knives for cultivating sides of beds and flat knives for top of beds.



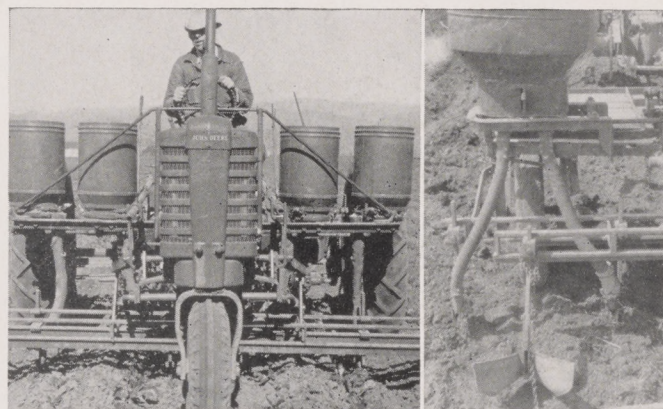
Fig. 21. Thinning is generally done with a short-handled hoe, leaving from 100 to 125 beets to each 100 feet of row.



Fig. 22. Thinning a field planted with sheared seed. Approximately 90 per cent of the sugar beet acreage in this district is planted with sheared seed at the rate of 5 to 7½ pounds per acre. Sheared seed makes possible a definite saving in thinning labor costs.



Fig. 23. Sugar beets are usually hoed ten days to two weeks after thinning. This early hoeing eliminates weed competition and reduces overall weeding costs.



Courtesy John Deere Plow Co.

Fig. 24. Commercial fertilizer is applied generally to sugar beets in this district following thinning. An attempt is made to place this fertilizer 4 to 6 inches deep and from 3 to 4 inches from the beet row. The majority of growers apply from 80 to 120 pounds of nitrogen per acre at this time.



Fig. 25. Water is applied as soon as possible after fertilization and hoeing so that the fertilizer will become available to the plant.



Fig. 26. Sugar beets in this district generally receive from one to five irrigations in which from $\frac{1}{2}$ to 3 acre feet of water are applied during the season.



Courtesy Caterpillar Tractor Co.

Fig. 27. Beets are loosened in the ground for hand topping by means of either a single or double standard subsoiler type plow. Each alternate unit of 8 beds is generally plowed in the same direction so that the beets in the 8 bed unit are tipped in the same direction to aid in topping.



Fig. 28. Field workers top both rows on the bed at the same time, working in 8 man crews.



Fig. 29. Filipino topping crews working on a contract basis generally place the beets in windrows with the roots pointed in one direction. This enables them to obtain maximum work output, as it simplifies the picking up of beets for throwing into trucks.



Fig. 30. Many sugar beet fields will be harvested with the two row Marbeet harvesters during the 1945 harvest season. Beets are plowed, topped and loaded in one operation.

SPRECKELS BULLETIN

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